Study of the Salivary Retention Of Fluorides After The Application Of Various Topical Reagents And Their Effect On Streptococcus Mutans

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Citation

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Abstract

Topical fluoride therapy (TFT) in the form of toothpastes, mouthrinses, varnishes and gels are effective caries preventive measures. Different fluoride compounds, different vehicles, and vastly different concentrations have been used with different frequencies and durations of application. These variables can influence the clinical outcome with respect to caries prevention and management. The efficacy of topical fluoride in caries prevention depends on a) the concentration of fluoride used, b) the frequency and duration of application, and to a certain extent, c) the specific fluoride compound used. Factors besides efficacy, such as practicality, cost, and compliance, influence the clinician's choice of preventive therapy. This study was conducted with the aim & objective to compare the retention of fluorides produced by various topical agents and compare the effects of fluoride on Streptococcus Mutans.

INTRODUCTION

Fluoride has played a pivotal role in oral health promotion over the past 50 years. The understanding of the process of dental caries and the mode of action of fluoride has changed in recent years. Dental caries is a continuous process of demineralization and remineralization of the enamel and fluoride plays a key role in this process through its action at the plaque enamel interface. It is now accepted that the primary mode of action of fluoride is post-eruptive. The post-eruptive action of fluoride has resulted in new methods of delivering fluoride.

The current health care trend is to provide evidence-based recommendations and treatment. Many literature reviews have shown fluoride's effectiveness against caries. The current use of fluoride in the prevention of dental caries is based on community, professional, and individual strategies. Personalized fluoride regimens should include a risk analysis and a review of the patient's current fluoride exposure. Fluoride use should be part of any preventive programme for the control of dental caries in children. Each child under the care of a dentist should have a carefully planned programme appropriate to the level of caries risk and age of each child.(1-3)

History: Fluoride varnishes were developed as individual alternatives to conventional topical fluoride application and are today gaining acceptance for clinical application. Two varnishes, Duraphat containing 5% wt NaF and Fluor Protector with 0.9% wt fluor silane, are available commercially. The clinical effects seem to depend mainly on application frequency, especially in high caries risk groups. The cost-benefit effect is high, but can be increased by delegating application to auxiliary personnel in conjunction with regular dental visits. Fluoride varnishes, such as Duraphat, are effective in increasing the fluoride content in the enamel and preventing caries. Varnish application is fast and easy. A professional prophylaxis before varnish application is not necessary, which decreases the application time. Patients receive significant preventive benefits with only semiannual varnish applications. Fluoride varnishes still await approval from the FDA for use as caries preventive agents. In the meantime, their use for such purposes is considered “off-label.” fluoride varnish treatments are known to result in elevated fluoride levels in plaque adjacent to fixed orthodontic appliances for a period of up to 1 week, although different patterns were disclosed for the various brands. Zimmer S. conducted a study in children aged 9-15 years, they suggested that the biannual application of Duraphat varnish in school-based programmes provides a caries inhibition of 38%. A caries inhibition of up to 40% was also be achieved by gels containing 1.25%

fluoride, if applied 30 times per year. (4-14)

A study was conducted in the Dept of Pedodontics, SDM College of Dental Sciences,Dharwad with the following Aims and objectives:

AIMS & OBJECTIVES

1. To study the salivary retention of fluoride in saliva after application of various topical agents.
2. To compare the retention of fluorides produced by various topical agents.
3. To study and compare the effects of fluoride on streptococcus Mutans.

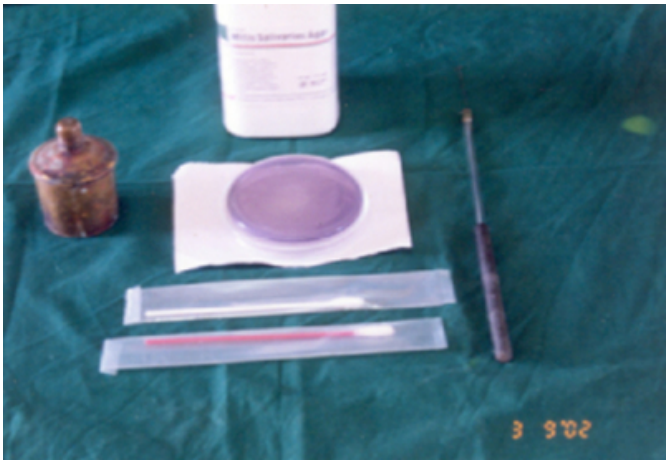
MATERIALS AND METHOD

The Sample consisted of randomly selected 25 children from the age group 8-12 years studying in a local school in Dharwad. The children were further divided into five groups consisting of five children each. The Armamentarium for the Fluoride Estimation consisted of

APFgel, FluorideFoam, Varnish, Dentrifice, toothbrushes, Foam application trays, probe, mirror, tweezer and applicator tips. The armamentarium for the microbial analysis comprised of Mitis Agar, Culture plates, Burner and loops. The Groups were treated with APF gel, Fluoride foam, Fluoride varnish, Fluoride dentifrice and Control group. The saliva samples were collected at various sample intervals. The Sample intervals were at baseline, 6 hours after application and 24 hours after application. The microbial analysis was carried out by streaking the agar in the culture plates with the saliva samples at the same intervals.

ARMAMENTERIUM FOR MICROBIAL ANALYSIS

Figure 1

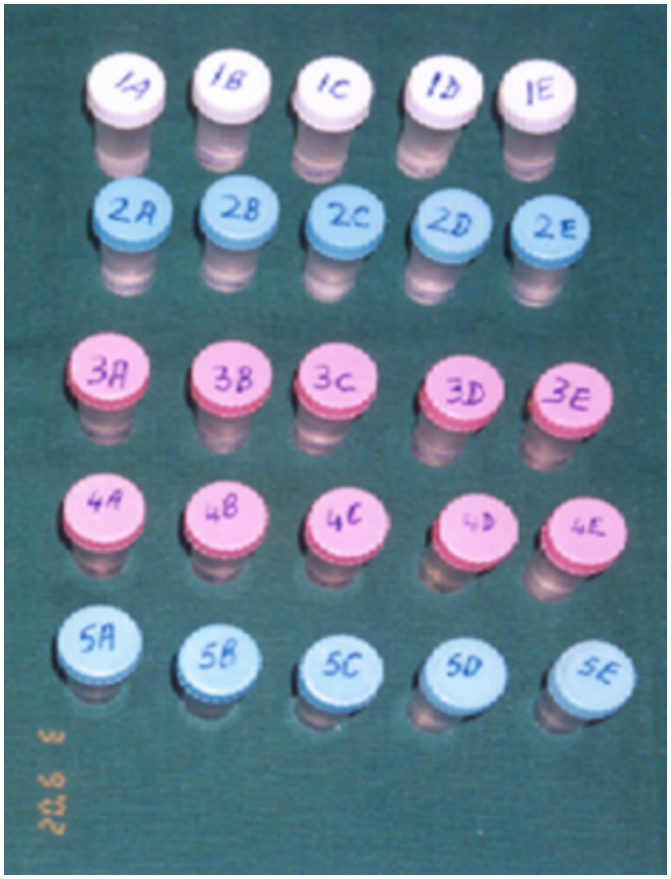


SAMPLE COLLECTION

Groups were treated with

- APF gel.
- Fluoride foam.
- Fluoride varnish.
- Fluoride dentifrice.
- Control group.

Figure 2



SAMPLE INTERVAL

- Baseline.
- 6 hours after application.
- 24 hours after application.

METHODS OF CONDUCTING THE STUDY:

1. FOR FLUORIDE ESTIMATION - SPADNS METHOD.

Principle: The presence of fluoride affects the rate of absorption of light leading to change in optical density and from the optical density the fluoride content in PPM can be derived.

Figure 3

Spectrophotometer

Armamentarium

2. MICROBIOLOGICAL ANALYSIS

Using a standard loop the saliva was streaked into the mitis salivarius agar. The colonies were identified on the basis of colony morphology and the colonies were scored arbitrarily.

Score

Less than 25 +

25 to 50 colonies ++

50 to 100 colonies +++

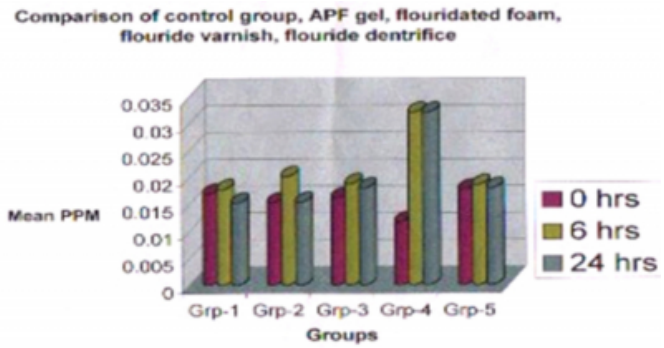
More than 100 ++++

Fig4

OBSERVATIONS AND RESULTS

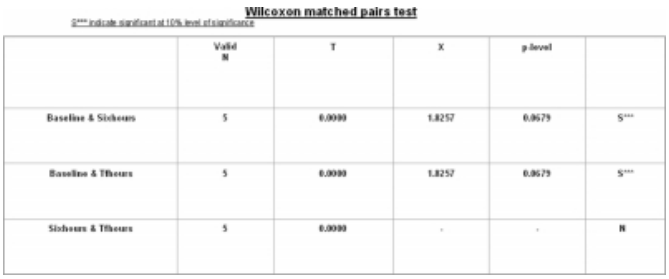
1) COMPARISON OF THE CONTROL GROUP,APF GEL,FLOURIDATED FOAM,FLOURIDE VARNISH&DENTRIFICE

Figure 4



MICROBIAL ANALYSIS

Figure 5



Wilcoxon matched pairs test

	Valid N	T	X	p-level	
Baseline & Sixhours	5	0.0000	1.8257	0.0679	S***
Baseline & Threes	5	0.0000	1.8257	0.0679	S***
Sixhours & Threes	5	0.0000	.	.	N

RESULTS AND DISCUSSION

The efficacy of topical fluoride in caries prevention depends on a) the concentration of fluoride used, b) the frequency and duration of application, and to a certain extent, c) the specific fluoride compound used. The more concentrated the

fluoride and the greater the frequency of application, the greater the caries reduction. Factors besides efficacy, such as practicality, cost, and compliance, influence the clinician's choice of preventive therapy

Clinically, fluoride varnish showed an increase in 6 hours and 24 hours depicting the substantivity in the oral cavity. In the intergroup comparison, the retention of fluoride varnish in the saliva was greater as compared to other topical reagents.This finding was in accordance with other studies. In studies comparing Duraphat varnish and APF gel, Duraphat varnish was equally or more effective than APF gel. Sealants were most effective in preventing occlusal caries. Four applications per year, or three weekly applications once a year, have been found to be effective. However, several studies have shown that two applications per year may provide comparable results. Application is fast and easy. Professional prophylaxis is not necessary, and the patient can leave immediately after the treatment. No acute toxicity has been reported after using any fluoride varnish.(15-18)

MICROBIAL ANALYSIS

Streptococcus mutans is a Gram-positive, facultatively anaerobic bacteria commonly found in the human oral cavity and is a significant contributor to tooth decay. The microbe was first described by Clarke in 1924. Along with S. sobrinus, S. mutans plays a major role in tooth decay, metabolizing sucrose to lactic acid. The acidic environment created in the mouth by this process is what causes the highly mineralized tooth enamel to be vulnerable to decay. S. mutans is one of a few specialized organisms equipped with receptors for adhesion to the surface of teeth. Sucrose is utilized by S. mutans to produce a sticky, extracellular, dextran-based polysaccharide that allows them to cohere to each other forming plaque.

In this study, it was observed that F ions in oral cavity inhibit the growth of S.mutans. The intragroup study, the difference in the baseline, 6 hours and 24 hours were statistically significant as the colony count decreased after 6 hours and 24 hours showing inhibition in the growth of streptococcus mutans. This finding was in accordance with other researchers. Van et al (1984) studied the effect of fluoride on the production of organic acids by Streptococcus Mutans in dental plaque. No difference was found in the accumulation of S. Mutans on the teeth between the fluoride-adapted and the control groups. However, there was a significant difference in the amount of lactic acid in metabolically resting plaque between the groups, lactic acid being lower in the fluoride-adapted plaque. Van Loveren C(1991) suggested that, if S. Mutans acquires fluoride resistance in vivo, the rate of acid production in dental plaque may be decreased at pH greater than or equal to 6, but increased at lower pH levels. Low concentrations of fluoride inhibit acid production less effectively.(19-22)

CONCLUSIONS

The Conclusions that could be drawn from this study were clinically, fluoride varnish showed substantivity in the oral cavity. and the retention of fluoride in saliva can be correlated to the inhibition of the growth of S.mutans.,The methods used for the Fluoride estimation should be more specific, moreover there remains a need for further trials. It is important that these trials should be of high quality and include assessment of potential adverse effects.

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